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SCIENCE AND TECHNOLOGY

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CONTENTS

PHYSICS

S&T Breakthrough Targets for Eighth 5-Year Plan

40081035a Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 8 Apr 89 p 1

[Article: "State Planning Commission Fixes Conception Outline of Eighth 5-Year Plan Science and Technology Breakthrough Efforts"]

[Text] The State Planning Commission has revealed that during the Eighth 5-Year Plan the state will continue to organize key science and technology breakthrough efforts and will change the practice, used in the Sixth and Seventh 5-Year Plans, of having only a state-level planning organization; it will implement a three-level combination of state, industry and local breakthrough project planning and form a national-scale scientific and technological breakthrough activity.

According to planning commission vice chairman Zhang Shou [1728 1108], during the Eighth 5-Year Plan the state will continue to implement the guiding principle of having science and technology orient themselves toward economic development; the State Planning Commission will continue to treat the science and technology plan as an important component of the mid-term to long-term state plan for economic and social development and will strive to organically integrate the science and technology plan with the plans for key construction, key technical modernization, technology importation and the utilization of foreign capital so as to solve the problem of linking science and technology to the economy more effectively.

The State Planning Commission expects that breakthrough plans at the different levels will solve technology problems belonging to these levels. The state breakthrough plan is the focus of national science and technology breakthrough efforts, primarily involving the solution of major trans-locality, trans-industry technological problems in which forces are concentrated and the topics are few and sophisticated. The industry breakthrough plans will have distinctive industry characteristics, and will select key science and technology topics that will have a key effect in promoting sectorial development. The locality breakthrough plans will concentrate on certain scientific and technical topics that are important for invigorating the local economy.

Zhang Shou said that implementation of the science and technology breakthrough plans will institute two-level state and local management and thus will help to bring into play both the State Council departments and the governments of the provinces, municipalities, autonomous regions and directly subordinate cities, and in addition will help the integrated departments make the fundamental changes needed for macroscopic management. Implementation of the science and technology breakthrough plans also requires observation of the principle of improved disposition of funding sources and further adoption of the competitive mechanism. The breakthrough projects will institute the bid solicitation system and will combine research funding, superior scientific and technical personnel, and good experimental facilities, so that small research funds will produce a greater effect and efforts will be made to obtain the best results from the Chinese Academy of Sciences, the advanced academies and schools, the large academies and institutes of the production departments, military engineer forces and our mainstay enterprises.

He pointed out that at present, the state-level, industry and local scientific and technical planning systems are still not in good condition. When the localities draft the province-level breakthrough plans, they must consistently proceed in terms of their actual conditions, integrate research, engage in overall planning, specify their own breakthrough points, and conscientiously avoid biting off more than they can chew; the breakthrough plans must not be multileveled and must not be extended to the localities and counties.

Plans for breakthrough efforts in major scientific and technical problems of economic and social development were begun in 1982 and have now been in use for 6 years. The funding for breakthrough projects in the Sixth 5-Year Plan was 1.5 billion yuan, and 38 programs were designated, with 1,450 specific topics, which produced 3,896 major scientific and technical results. At present, more than 80 percent of the results are being used in key construction, technical modernization, and industrial and agricultural production. The breakthrough investment in the Seventh 5-Year Plan was about 5 billion yuan; 76 programs and nearly 4,000 topics were selected, and 100,000 picked scientific and technical personnel and leaders were committed to them. In the 3 years of their implementation, major advances and epoc-making results have been obtained in the development of agricultural science and technology, the opening up of new fields, and the development and domestic production of major equipment, and 80 percent of the results have been on a par with the 1980's world state of the art.

1989 Torch Projects Reviewed

40081035b Tianjin ZHONGGUO JISHU SHICHANG BAO [CHINA TECHNOLOGY MARKET NEWS] in Chinese 5 Apr 89 p 1

[Article: "Review of First Group of This Year's Torch Projects Completed"]

[Text] The State Science and Technology Commission's Torch Plan office and the Torch Plan Foundation recently organized the relevant experts for a preliminary evaluation of the 1989 Torch project submitted by the localities and departments.

This evaluation covered 729 projects. Conscientious expert discussion and rigorous screening led to preliminary approval of 99 projects as the first group of state-level Torch projects for 1989: 104 were found basically in agreement with the requirements for state-level Torch projects, and another 381 projects were suggested for screening by the localities as local Torch projects.

The 99 projects accepted at the state level require a total funding of 385 million yuan, including 198 million yuan in independently raised funds and application for state funding of 187 million yuan.

These 99 projects are primarily in five high-technology fields: 40 in electronic communications, 18 in new materials, 14 in biotechnology, 13 in mechanical-electrical integration, 3 in new energy sources, and 11 in other areas. The range of projects is rather broad, embracing key state research academies and institutes, advanced schools and large and medium-size enterprises, and also privately run research organizations and various types of science and technology enterprises.

Technique for Optimal Selection of General Design Parameters of Missile

40090063a Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 1-9

[English abstract of article by Liu Zongying [0491 1352 2503] of Office 805, Shanghai Aerospace Bureau; Jin Liangchao [6855 5328 6389] of the Ministry of Aeronautics and Astronautics]

[Text] This paper discusses a technique for tackling the optimal selection problem affecting the general design parameters of a missile. In this paper, an example is given to illustrate the application of the optimal selection technique to combining the orthogonal design with a step-by-step casting net and high mounting. The results show that a small amount of calculation, high efficiency and convenience in use are the advantages offered by this technique.

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Nonlinear Control of Large-Angle Attitude Maneuvers for Flexible Spacecraft with Angular Momentum Transfer

40090063b Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 10-18

[English abstract of article by Jin Liang [6855 2733] of Beijing Institute of Control Engineering]

[Text] In this paper, a singularly perturbed nonlinear model of flexible spacecraft dynamics is represented using the angular velocity, Euler quaternion and flexible modes. The reduced system and corrective control are described on the slow manifold M_e. The corrective control is expressed by the rigid-body control and rigid modes. The reduced system is transformed into a global equivalent linear system in controllable canonical form. The control torque commands of the actuators have been designed. Numerical results are presented for a three-axis stabilized satellite with flexible solar arrays.

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Attitude Control Problems of Satellite as Liquid Apogee Motor Is Working

40090063c Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 19-27

[English abstract of article by Luo Jiansan [5012 1696 0005] of Jinzhou Institute of Technology; Lu Zhenduo [0712 2182 6995], et al., of Beijing Institute of Control Engineering]

[Text] This paper presents the dynamic equations of a three-axis stabilized satellite during an apogee maneuver in a transfer orbit. The dynamic interaction between the satellite, solar arrays and propellant has been taken into account. The control loop design, computer simulation and stability analysis using the root locus and description function have been performed, and a preliminary conclusion has been reached.

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Serial Image Analysis Technique, Detecting Three-Dimensional Parameters of Objective

40090063d Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 28-36

[English abstract of article by Li Jinzong [2621 6855 1350] of Harbin Institute of Technology]

[Text] Serial image analysis is a new subject which is becoming increasingly important. In this paper, the analysis technique is divided into two classifications—the method for optical flow analysis and that for geometric analysis. Upon expounding these analysis techniques, the research being stressed involves how to detect the flow velocity and three-dimensional geometric and motion parameters of the objective as well as how to recover its space structure. Mention is also made of how to recognize a three-dimensional objective. The linear algorithm is researched in more detail in this paper, and some experimental projects and results are presented. Also, a new project, the "versatile device for analyzing serial images and detecting three-dimensional parameters of the objective" (VDAD), is introduced. This paper concludes that the serial image analysis technique is progressing toward the completeness of theories and the realizability of applications.

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Parallel Algorithm Analysis, Its Implementations in Image Processing

40090063e Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 37-43

[English abstract of article by Zhang Dapeng [1728 1129 7720] of the Department of Automation, Qinghua University; Chen Junlin [7115 7486 2651] of Huabei Institute of Electrical Engineering]

[Text] In this paper, the potential parallel algorithms used for image processing are studied and their corresponding parallel architectures are given. In addition, the performance evaluation of the parallel algorithms is analyzed. It is feasible that this research will help in the development of parallel image processing computers.

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Fast Multi-Valley Optimizing Method Applied to Map Matching
40090063f Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 44-52

[English abstract of article by Ding Mingyue [0002 2494 6460], et al., of Huazhong University of Science and Technology]

[Text] The problem of map matching becomes a multi-valley function optimizing problem after the mismatching measures have been defined. Fast multi-valley optimizing is a new method for solving the optimizing of the mismatching measure proposed by the authors. In this paper, by applying the method, an exhaustive map matching search can be replaced by directional local searching, thereby saving much computation and guaranteeing a high registration accuracy of the matching. In addition, the relationship between the threshold and alarm probability is derived and a region of threshold factor which makes the alarm probability be less than a defined value is given for the Mean Absolute Difference algorithm. Finally, after conducting matching experiments on three different aerospace photographs using fast multi-valley optimizing and comparing the results with those of the Sequential Similarity Detection algorithm, the accuracy of this method is proved and it is shown that the advantages of high registration accuracy, small computational costs and ease by which the threshold can be selected, etc., are offered.

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Application of Spline Kantorovich Method in Bending of Anisotropic Plate, Cylindrical Shell
40090063g Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 61-69

[English abstract of article by Xu Houhua [1776 0683 5478], et al., of the National University of Defense Technology]

[Text] The Spline Kantorovich method is a type of Kantorovich numerical method created by Chen (reference 1). Not only can it transfer two-dimensional problems into one-dimensional ones, but it also offers the advantages of the Spline method, such as high precision, rapid convergence, suitability for various kinds of boundary conditions and availability for either a plate or cylindrical shell. The formulas for bending problems of isotropic or anisotropic plates and shells are established, and the applicability of this method has been demonstrated by many numerical practices.

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Attitude Dynamics of Satellite with Flexible Appendages

40090063h Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 79-85

[English abstract of article by Shao Chengxun [6730 2052 8113], et al., of Harbin Institute of Technology]

[Text] The equations for the attitude dynamics of a satellite with flexible appendages are derived in this paper by using the d'Alembert principle in virtual work form. It is suggested that the contributions of the modal angular momentum to the inertial moment of the appendage can be used as a criterion for the reduction of orders of these equations. A numerical example is given in this paper.

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Self-Adaptive Processor for Detecting Earth Horizontal Signal in Communications Satellite

40090063i Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 86-90

[English abstract of article by Zou Guangrui [6760 1639 3843], et al., of Beijing Institute of Control Engineering]

[Text] This paper analyzes the problems existing in the world general method in which a infrared radiation signal from the earth's edge is used as a reference signal for the antenna system in a satellite, and presents an earth center self-adaptive determination method in accordance with control theory and the numeric calculation principle.

According to the method, a self-adaptive processing system for detecting the earth's horizontal signal is realized in the control system in communications satellites. The accuracy of the method has been proven by its logic function, wave form, error analysis and calculation, and ground simulation and flight tests. The method is better than the world general one.

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Computation of Lateral Bend Vibration Characteristics of Missile

40090063j Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 1989 pp 104-112

[English abstract of article by Liu Shiquan [0491 4258 3123] of the Institute of Base 066]

[Text] An analytical method is presented in this paper for calculating the lateral bend vibration characteristics of the missile, including the inner structure beam in the missile body. Specifically, it is used to calculate the local vibration frequencies and mode shapes of the inner structure beam of the missile body. In this paper, it is

7

AEROSPACE

given the transfer matrices of the "S. Timoshenko-beam" element with lumped quantities and a missile body that includes the inner structure beam, and the effect of the masses of the propellant grain of the solid-propellant motor on the vibration characteristics of the missile body are analyzed. In this paper, the lateral bend vibration characteristics of some missiles are found, and the computed results are shown to be in good agreement with the experimental ones.

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Advanced LISP Computer Developed

*40080196b Beijing JISUANJI SHIJIE [CHINA
COMPUTERWORLD] in Chinese No 20, 24 May 89 p 1*

[Article by Zhao Yinliang [6392 6892 0081]: "China
Develops a LISP Computer Meeting International Stan-
dards of the 1980's"]

[Text] The LISP-M1 system, the first Chinese LISP
computer meeting international standards of the 1980's,
has been developed in the New Computer Laboratory of
Xi'an Jiaotong University, and in May passed its tech-
nical evaluation held jointly by the State Education
Commission and the Shaanxi Province Science and
Technology Commission.

The LISP-M1 system is a computer intended for artifi-
cial intelligence (AI) applications and has an advanced
system structure. The system begins with normal chips
and uses such techniques as a tagged data format,
high-speed hardware stacks, chained-list compression,
and memory mapping to support the LISP language
implementation, which greatly improves system oper-
ating speed. To use the execution speed of a benchmark
program (the TAK 18 12 6) as an example, in compar-
ison with several foreign LISP computers the LISP-M1
runs the program in 0.47 second, the Symbolics 3600
runs it in 0.43 second, and the [Texas Instruments]
Explorer runs it in 1.18 seconds.

The LISP-M1 system runs all functions of MCLISP
version 1.2, which is compatible with Common LISP,
and it provides a highly flexible user interface that is
quite useful.

The successful development of this system has great
significance for China's AI research and applications,
and will play an important role in advancing research of
China's new-generation computer systems.

[Note: For more detailed information, see JPRS-
CST-88-020, 28 Sep 88, pp 32-35, and JPRS-
CST-89-008, 29 Mar 89, pp 49-50.]

Taiji Microimage Processing System Introduced

*40080196c Beijing JISUANJI SHIJIE [CHINA
COMPUTERWORLD] in Chinese No 20, 24 May 89 p 1*

[Article by Xia Tiemin [1115 6993 3046]: "Taiji Com-
pany's Newest Offering: the Taiji III Microimage Pro-
cessing System"]

[Text] The Taiji Computer Company recently developed
a new microimage processing system built around a
microcomputer with graphics board and a supplemental
basic software package—the Taiji III Microimage Pro-
cessing System. This system can be widely used in such
diverse scientific and technical fields and manufacturing
sectors as materials analysis, meteorology, medicine,
remote sensing, public security, and printing. It is being
welcomed by users because of its low cost and high
performance, and its application has a promising future.

This processing system uses as its host machine the Taiji
386 high-grade microcomputer developed and manufac-
tured by the Taiji Company (but can also be used with
other 386 and 286 microcomputers, and with PC/AT
and PC/XT micros). It is a general-purpose digital
image-processing system composed of graphics boards,
image input/output equipment, and a printer. What is
special are such system features as the pseudo-color
graphics board, which has good performance and high
speed in comparison with similar products; its frame
memory can be as much as 1 Mbyte, and it has a
512X512 display resolution and real-time image acqui-
sition (at 1/25th second per frame). Its 8-group search
table implements real-time image processing and
pseudo-color display, and it also has hardware expansion
and image rolling functions. When connected to a video
camera, it can process and analyze actual images; if
attached to a microscope, it can do medical image
analysis and materials analysis; and if a mouse is
attached, it is even more interactive. Its images can be
directly displayed on monitors or can be output to a
printer, and if additional equipment is added, images
may be preserved through photography.

Another characteristic of this system is that the engineers
have developed a basic software package for the system
that has menu-style organization and powerful interac-
tive functions, and is easy to use. This software has such
functions as image input/output, image processing,
image geometry, and graphics; this lays a foundation by
which this system can enter all application fields. It is
worth mentioning that the system has incorporated the
microimage-analysis software of the GDR's Robotron
Company, among which noteworthy functions are chro-
mosome analysis software, cell analysis software, and
materials analysis software.

High-Level Data Link Controller Developed

*40080196d Beijing JISUANJI SHIJIE [CHINA
COMPUTERWORLD] in Chinese No 20, 24 May 89 p 2*

[Article by Jing Xuan [4842 5503]: "The HDLC Com-
puter Intelligent Communications Controller Is Intro-
duced"]

[Text] The HDLC [high-level data link control] com-
puter intelligent communications controller successfully
developed by Institute No 14 of the Ministry of
Machine-Building and Electronics Industry can be
applied not only in such military electronic equipment as
radar, but can also be widely used for control in posts
and telecommunications, hydraulics, aviation, and large-
scale industry, and its prospects for application are quite
far-ranging.

The HDLC computer intelligent communications con-
troller uses the OEM single-board computer iSBC 88/45
intelligent communications board made by the U.S.'s
Intel Corporation, and via secondary development, it
can act in a computer system as a front-end processor
with significant processing capability—one that can

handle data communications between the entire system and other electronic equipment.

As a communications controller, its system structure is as follows: it uses the iAPX 8088 as the CPU, with the 8273 and 8274 chips for control of communications protocols. An 8259A handles all communications system interrupts, which are programmed through an 8254; this allows data transmission rates as high as 888K bauds. Modem control is through an 8255. In addition, to avoid host-computer interference during the data transmission process and to reduce the work load for that host, an 8237A-5 chip controls DMA [direct memory access] data transmission. Data is exchanged between the 88/45 board and the computer system directly through shared RAM. Software configurations make use of the advanced international communications protocol HDLC/SDLC (high-level data link control/serial data link control). The frame structure is composed of an initialization tag, address, control, information segment, cyclic-redundancy-check (CRC) character, and conclusion tag. The initialization and conclusion tags are 8-bit special characters; CRC is used to reflect errors during the transmission process; the information segment is a data region of up to 1,024 bytes; an 8-bit control field has an implied response function; an 8-bit address field has required station addresses that must be received, as for example when the field must be expanded to 16 bits; and all this enables this communications system to undertake data communications between at least 256 stations through only one communications circuit.

This HDLC computer communications controller has such features as a high transmission rate, dependability, good transparency, and flexible, easy operation. Within three data-transmission channels, it can handle synchronous and asynchronous full- and half-duplex communications from point to point, between host and substations, and within rings.

More Work Urged for Bubble-Memory Development
40080189a Beijing ZHONGGUO DIANZI BAO in Chinese 9 May 89 p 3

[Article by Qing Feng [7230 1496] and Liu Zengmin [0491 1073 3046]: "Experts Discuss Prospects for Bubble-Memory Technology"]

[Text] Should we continue to make provisions for developing bubble-memory technology during the Eighth 5-Year Plan? This subject was discussed fully at a conference held recently by the Department of Microelectronics and Basic Products under the Ministry of Machine-Building and Electronics Industry.

The magnetic bubble memory is a large-capacity, nonvolatile, entirely solid-state magnetic storage, the basic technology behind which is to epitaxially grow magnetic single-crystal thin film on a gadolinium gallium garnet substrate. Using LSI techniques, one can make magnetic bubble circuits that can perform various functions.

The experts stated that at present, although there are such storage and recording systems as magnetic tape, magnetic disks, magnetic drums, and semiconductors, when compared with the magnetic bubble memory, the latter has several outstanding characteristics, primary among which are simplicity and reliability, radiation resistance, high capacity for endurance in harsh environments, permanent retention, and an absence of mechanically rotating devices. Therefore, it has obvious advantages over other storage and recording technologies when used for storage and recording applications in such situations as nuclear testing, on missiles, and on aircraft. In addition, it has value in its broad applications to civilian equipment (such as telephone exchanges, numerically controlled machine tools, and precision meters). Therefore, it is necessary to continue developing this memory technology.

The bubble memory has developed quickly since its introduction abroad in 1967. Production and real applications began in 1977, capacities have expanded from 64 Kbytes to 4 Mbytes, and now there are even 16-Mbyte devices, with 64-Mbyte devices currently under development. After 10 years of hard work, the foundation for the development of bubble-memory technology in China has been laid. This foundation extends from materials and devices to applications; under it, an S&T contingent has been trained to a significant level. These specialists have completed research on 64-100-Kbyte devices, and during the year before last and last year, respectively, made mask plates for 256-Kbyte and 1-Mbyte bubble-memory chips; they have begun work on limited applications of integrated systems, and have made great advances in the basic research on the Bloch linear bubble memory. But in their overall view, the experts felt that our research capacities are too weak, our level of technology is too low, and application aspects are yet to be explored.

At the conference, the experts recommended that we should include bubble-memory devices among key tasking for the Eighth 5-Year Plan, that we should continue to invest research, production capacity, and funds at appropriate scales, and that we should undertake technology transformation of existing equipment and clean-room conditions. We should more quickly develop this technology so that it might serve the national economy.

Information High-Technology Institute Established
40080189b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 18, 10 May 89 p 2

[Article entitled: "Joint Institute of Information High Technology Is Established"]

[Text] On 14 April 1989, the "Joint Institute of Information High Technology" ("Joint Institute" for short) was founded jointly by the Computer Departments at Beijing University, Beijing Aerospace University, Beijing Science and Engineering University, Northwest

Polytechnical University, East China Engineering Institute, and Hunan University, as well as by the Department of Automation at South China Science and Engineering University, by Institute No 706 of the Ministry of Aeronautics & Astronautics Industry, by the Second Artillery Corps' Engineering Institute, and by the Yanshan Computer Applications Research Center.

The Joint Institute is wholly owned by the people, and is a pioneering laterally associated flexible integrated body that is open [to the outside world]. It is self-operated and has an independent accounting system. Its leadership structure is a management commission composed of representatives from each of the participating units. Specific day-to-day work is done under the institute director responsibility system, and the Joint Institute also has an academic committee, which is composed of high-level researchers sent by each participating unit and well-known invited domestic and foreign professors and specialists.

The primary directions of research and tasking for the Joint Institute are:

1. Research tasking in mid- and near-term information and high-technology and applications systems engineering needed for China's modernization; and international information high-tech cooperative research.

2. Development tasking for new-generation computers, which includes both hardware and software systems.

3. Research tasking in artificial intelligence, such as robotics, expert systems, knowledge bases, language recognition, and image recognition.

4. Research tasking in systems engineering, such as the building of model and development applications software.

5. Development tasking in data communications and network engineering.

6. Fostering of academic exchanges domestically and internationally; dissemination of new domestic technologies; introduction of advanced foreign technology and dissemination of applications.

7. Publishing of scholarly journals and monographs in information high technology.

8. Solicitation of Master's and PhD graduate students, and training of mid- and high-level research personnel.

The Joint Institute has 350 technical personnel, among whom one-fourth are high-level professional researchers, and who include several scholars and experts who are well known both domestically and internationally. There is also a key technical group of the middle-aged and young, who are boldly exploratory and innovative, and who also have genuine talent and sound scholarship, all of whom combine to form a rich technical team.

This new research organization (the Joint Institute) will find new directions within the environment of China's restructuring and openness.

Energy Minister Addresses Environmental Protection Conference

40081038 Beijing ZHONGGUO HUANJIN BAO in Chinese 2 May 89 p 3

[Article: "Truly and Fully Implement the Basic National Policy of Environmental Protection—Summaries of Speeches at the Third National Environmental Protection Conference"]

[Excerpts] [passage omitted]

Develop Energy Resources, Protect the Environment

[Text of speech by Huang Yicheng [7806 3015 6134], vice chairman of the State Council Environmental Commission and minister of the State Ministry of Energy Resources]

The energy sector is an indispensable major pillar in developing the national economy and improving the people's lives, and it is a major source of pollution. Thus, we must resolutely protect the environment in developing and utilizing energy resources. I would like to offer some views in this regard.

I. Energy Resource Development Should Be Concerned With Protecting the Environment

The Ministry of Energy Resources made the necessary arrangement and decisions in the "Outline Plan for Medium-Term Energy Resource Development in China." For example:

Future thermal power construction should develop high parameter, large capacity, and supercritical generator sets, mainly 300 MW and 600 MW, to reduce the national average amount of coal consumed from 423 g to 355 g per kWh. Coal consumption to produce power in new large generators which go into operation should not exceed 330 g/kWh. This can conserve more than 80 million tons of coal and reduce total power plant pollutant discharges by more than 20 million tons.

Focus on developing pit-mouth power plants, implement joint coal and power management, keep pollution sources far from cities. We also can give unified consideration to water discharged by coal mines and water used by power plants, return powdered coal ash from power plants and gangue from coal mines to fill mines and pits, and other comprehensive technologies for mutual utilization, and reduce the amount of land taken up by discharges of gangue and powdered coal ash.

Adopt highly effective electrical dust removers and dry ash removal technologies in a widespread fashion to conserve water and reduce secondary pollution by ash and water.

Give attention to developing and utilizing subsided coal mine areas.

In addition, we should develop gangue power plants and implement heat and power cogeneration. Gangue also can be used as a construction material. This would involve comprehensive utilization, reduce the amount of land taken up by gangue heaps, and reduce atmospheric pollution from spontaneous combustion of gangue heaps. Make a major effort to develop coal dressing and processing, raise the washing rate for coal, reduce the transport burden, and lower atmospheric pollution by urban and coastal power plants. Closed cycles should be implemented for the waste water from coal washing.

II. Strive for Energy Conservation, Reduce Environmental Pollution

Energy resource conservation and higher energy resource utilization rates are the main ways to reduce pollution and protect the environment. China now has an energy resource shortage and widespread high unit energy consumption and substantial waste. The amount of energy resources China consumes per dollar of GNP is about 5 times that in France and 4.4 times that in Japan. This illustrates China's great potential for energy conservation. Thus, we must closely integrate environmental protection and energy conservation work. China's energy resource structure which is dominated by coal requires us to focus on coal conservation and prevent smoke pollution from coal. First, strictly control blind development of small industrial boilers, improve existing small boilers, develop centralized heat supplies, and integrate heat and power. China has almost 400,000 small boilers which consume 300 million tons of coal annually and cause severe pollution. Integration of heat and power can increase the utilization rate of coal and greatly reduce pollutant discharges.

Second, severely restrict development of condensed steam type small power plants and transform those already built into joint heat and power plants.

Third, reorganize small enterprises with high energy consumption, low energy utilization rates, and substantial pollution. Reorganization should be required for all cases in which the unit energy consumption of products exceeds state-determined standards.

Fourth, accelerate extension of civilian shaped coal.

Fifth, study and extend new technologies for energy conservation and environmental protection. Small scale industrial boilers in the 2 to 35 tons/hour range should extend fluidized bed and cycled fluidized bed boilers, which can increase the thermal efficiency of small boilers to 80 to 85 percent. The addition of sulfur solidifying agents can remove 80 percent of the sulfur dioxide and reduce nitrous oxide by 50 to 60 percent. The petroleum industry also should do good work to recover light hydrocarbons and to reduce and avoid their discharge into the atmosphere.

III. Reinforce Environmental Management in the Energy Resource Industry, Strengthen Development of S&T

Enterprises in all industries should implement an environmental goal responsibility system and make environmental goals an important part of contractual responsibility for

enterprise management. Only those enterprises which fulfill environmental goals should be allowed to rise in grade.

Study all types of pollution prevention techniques adapted to China's national conditions. The focus of arrangements should be placed in particular on projects with comprehensive environmental, production, energy conservation, and resource recovery benefits and which have development prospects.

[passage omitted]

Concentrate Capital To Deal With Acute Environmental Problems

[Speech by Shanxi Provincial People's Government]

Building the Shanxi Energy Resource Base Area is a glorious but difficult task given to the people of Shanxi by the party and state. In 1988, Shanxi shipped out 175 million tons of coal, equal to more than 80 percent of the amount of coal shipped out nationwide, and it transmitted out 5.43 billion kWh of power. One coal car leaves Shanxi every 7 minutes on the average. The Shanxi Energy Resource Base Area has made enormous contributions to economic construction and modernized construction for all of China. However, economic development has caused increasing degradation of Shanxi's ecological environment which in combination with historical deficits has polluted 70 percent of Shanxi Province's rivers in varying degrees. There is a universal drop in the water table and severe atmospheric pollution, and 60 percent of our land area suffers from soil erosion. Serious environmental problems are now the main factor restricting economic development. They cause hardships for production and the people's lives, and the masses are urgently crying for protection and improvement of the environment. To deal with this situation, leading organs including the Shanxi Provincial CPC Committee, Provincial People's Congress, Provincial Government, and others profoundly understood the importance and urgency of protecting the environment and felt a deep historical sense of responsibility on their own shoulders. If we fail to strengthen environmental protection we not only violate the trust of the people but also shame our ancestors and descendants.

For the past few years, leading organs in the Shanxi Provincial CPC Committee, Provincial People's Congress, and Provincial Government have focused on comprehensive environmental control of key regions and river basins given the concentration of Shanxi's population, economy, and pollution in several river valleys.

In 1984, the Shanxi Provincial Government convened its Standing Committee to discuss plans and implementation programs to control pollution in Taiyuan City. They agreed to allocate a special fund of 20 million yuan annually from provincial revenues beginning in 1984 to subsidize pollution controls in the Taigang [Taiyuan Steel Mill] industrial region and Hexi [West River] chemical industry region. Over the past 5 years, these two regions have begun 42 control projects and invested 159.31 million yuan in capital, including 115.477 million yuan from provincial revenues, and 31 projects have been completed and placed into operation. The two regions obtained obvious benefits after adopting centralized control. The value of industrial output at Taiyuan Steel Mill increased by 55 percent and steel output by 25 percent over 1983 but waste water discharges fell by 33.7 percent and precipitates in the plant region declined 25.8 percent. The gross value of output at the Taiyuan Chemical Complex increased by 13.7 percent but sulfur dioxide discharges in the waste gas declined by 30 percent, nitrogen oxides decreased by 16 percent, phenol in waste water decreased by 60 percent, and there were economic benefits like recovered coal gas and unrefined benzene, coal conservation, and so on.

In 1986, the Shanxi Provincial People's Congress Standing Committee proposed the idea of comprehensive control of the Fen He in an inspection report on pollution in the Fen He river basin. The Shanxi Provincial Government made comprehensive control of water-borne pollution in the Fen He basin a key part of work in the Seventh 5-Year Plan and implemented the principles of combined management and control, phased control, and gradual solutions. They decided to allocate 20,000 yuan annually from provincial revenues beginning in 1988 to subsidize soil conservation work in four counties in the upper reaches. In the Taiyuan section, they combined strict control over new pollution with a focus on control of industrial waste water. They allocated 1,000 yuan each year from provincial revenues beginning in 1987 for point source control in conjunction with building two large polluted water processing plants and a comprehensive utilization project, and there has been an initial improvement in the trend toward degradation in water quality in the Taiyuan section.

After surveys and inspections by the Shanxi Provincial People's Congress, the Shanxi Provincial Government proposed that Kouquangou in Datong City, Guangshen Temple scenic area in Hongdong County, Yongji County, Zhangze Reservoir in Changzhi City, and Dan He river basin in Jincheng City be made focal control regions. Definite achievements have been made in comprehensive control work in these regions. The Shanxi Coking Plant, the main pollution source in the Guangsheng Temple and other regions invested 12 million yuan to complete nine control projects. The relevant departments and enterprises in Shanxi Province invested 3 million yuan in Yongji County to build key point source control and pollutant discharge projects. Changzhi City used construction of oxidation ponds and point source control at Zhangze Reservoir, its main source of drinking water, and made substantial improvements in the reservoir. Eleven of the 14 limited period control projects assigned to Dan He basin have been completed and water quality is improving. The Shanxi Provincial Government also formulated the principles of "guidance, support, integration, and transformation" for implementation by township and town enterprises. They focused on preventing pollution from primitive coking in township and town enterprises and decided to shut down all primitive coking kilns before 1990. More than 60 percent of local coking transformation has now been completed.

[passage omitted]

State-of-the-Art Machining Center Goes Into Production

40080189c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 18, 10 May 89 p 2

[Article by Wang Zhe [3769 0772]: "The TC500 Machining Center Is Born in Nanjing"]

[Text] Joint production on one of the major high-technology development projects of the state's Seventh 5-Year Plan—the FMC Flexible Machining Cell primary machine tool model TC500 computer-controlled horizontal machining center meeting advanced contemporary international standards—was recently completed by the Nanjing Machine-Tool Plant and the FRG's Wen-nai-er [phonetic] Machine Tool Plant, Ltd., and the machining center went into production in Nanjing in early April. The appearance of this kind of machine tool fills a void in China's numerically controlled (NC) machine-tool products, and foretells the coming of the age of unmanned operation for China's NC machine tools.

The model TC500 machining center combines the functions of a lathe, of milling, boring, drilling, and tapping, and can accomplish the machining of various complex parts while having such features as high speed and high precision. It can be fitted with 60 cutting tools, can change a cutting tool within 3 seconds, and the entire machining process is accomplished by computer, which is especially suitable for the machining of various complex 3-dimensional solids in such industries as aircraft, motor vehicles, and shipbuilding. At the same time, several TC500 machining centers have been linked to robots, thereby forming FMC flexible machining cells under unmanned operation. In 1986, the Nanjing Machine Tool Plant signed an agreement with the Wen-nai-er Company to jointly manufacture the TC500 machining center. During the problem-solving process of the past 3 years, 21 technical difficulties having to do with the manufacture and installation of major components finally brought the performance specifications of this machine tool up to advanced international standards. It will represent both companies in the World Machine Tool Exhibition to be held in Shanghai in May.

Automatic Programming System for NC Milling Machine

40080196a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 19, 17 May 89 p 23

[Article by Tai Ling [3141 1545]: "Milling-Machine Numerically Controlled Automatic Programming System"]

[Text] The HC-87CAM Milling-Machine Numerically Controlled Automatic Programming System, meeting advanced domestic standards, was recently developed by the Xi'an Aircraft Manufacturing Company of the Ministry of Aeronautics & Astronautics Industry, and it is also being used in production, where it has generated good economic results.

In 1987 this company took on more than 10 aircraft component machining contracts for the American Boeing Company and the Canadian Aircraft Company. To improve processing efficiency and stabilize product quality, the company based itself on active assimilation and absorption of key foreign technologies and materials; its problem-solving group integrated real demands in developing this milling-machine numerically controlled automatic programming system. After repeated debugging and several improvements, the system continues to improve and has already machined 1,400 pieces of different specifications. The machining precision, tolerance and dimensions have met the American Boeing Company's quality and verification standards. This automatic programming system is fitted with the E14 numerical control device, which can program work interactively, can handle such areas in complex components as internal channels, veins, flanges, and edges, and also satisfies their technical requirements. The programming time is shorter than that of conventional software, and it is easier to handle. It can also be modified at any time the need arises, which is good for solving technical problems. It also comes with an automatic fault-diagnosis system and an electronic digital display, and if the accompanying software or hardware experiences an abnormality, the display will report the cause of the fault, thus allowing maintenance personnel to promptly deal with the problem. The system is quite adaptable and is not only suitable for the aircraft manufacturing industry, but can also be useful for the machining of machinery, dies, and industrial fittings.

Electromodulation Mechanisms of Optoreflectance Spectra in Quantum Well Structures

[English abstract of article by Jiang Desheng [3068 1795 3932], et al., of the Institute of Semiconductors, Chinese Academy of Sciences, Beijing]

[Text] The electromodulation mechanisms of the photoreflectance (PR) spectra of quantum well (QW) structures are studied. The variation of dielectric function due to the electric field and the corresponding spectral line shapes of the PR of QW_s are analyzed based on the Stark effect modulation of non-excitonic and excitonic interband transitions. The experimental results for GaAs/AlGaAs QW agree well with the theoretical analysis.

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Study of Passive Mode-locking in $TEACO_2$ Laser

[English abstract of article by Wang Bing [3769 0365], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The numerical simulative calculation of the passive mode-locking in a $TEACO_2$ laser is made using a fluctuation model, and the reasons for the lower probability of passive mode-locking are given. The calculation is confirmed through experimental results. A $TEACO_2$ ultrashort laser pulse produced by passive mode-locking with a 2-ns pulse width and power of 0.5 MW has been obtained.

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Effect of Nonlinear Gain, Waveguide Structure on Linewidth of Semiconductor Lasers

40090068a Beijing WULI XUEBAO /ACTA PHYSICA SINICA/ in Chinese Vol 38 No 5, May 89 pp 699-705

[English abstract of article by Guo Changzhi [6753 7022 1807], et al., of the Department of Physics, Beijing University]

[Text] The effect of nonlinear gain and the waveguide structure on the modal linewidth broadening produced by the quantum phase noise in semiconductor lasers has been investigated using semiclassical theory. It is shown that the modal linewidth depends not only on the linear gain, but also on the third order nonlinear gain and the waveguide structure. Therefore, a new linewidth broadening enhancement factor and a new mechanism for the power-independent linewidth component are proposed.

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Bistability in Interaction of Intense Two-Frequency Laser With Plasma

40090068b Beijing WULI XUEBAO /ACTA PHYSICA SINICA/ in Chinese Vol 38 No 5, May 89 pp 706-713

[English abstract of article by Ma Jinxiu [7456 6930 4423], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] This paper presents detailed studies on the bistability exhibited by the Langmuir wave driven by a two-frequency laser. The equations governing the evolution of the amplitude and phase of the Langmuir wave are derived fully relativistically. The bistable responses of both the saturated amplitude and steady amplitude of the Langmuir wave with respect to plasma frequency and pump intensity are studied, and the applications of hysteresis to the laser-plasma Beat-Wave Accelerator are discussed. Finally, the properties of the time evolution of the Langmuir wave amplitude near the critical point of the bistability are also investigated.

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Microwave Preionization Plasma in Tokama

40090068c Beijing WULI XUEBAO /ACTA PHYSICA SINICA/ in Chinese Vol 38 No 5, May 89 pp 714-721

[English abstract of article by Wang Long [3769 7393], et al., of the Institute of Physics, Chinese Academy of Sciences]

[Text] A currentless plasma has been obtained in a tokamak device using a powerful microwave at the

electron cyclotron frequency generated by gyrotron systems. Its electron density is up to 8×10^{12} cm^{-3}, the electron temperature is up to 50 eV, the particle confinement time is about 0.5 ms, and the heating efficiency is above 25 percent. The effect of the plasma on the toroidal breakdown and the heating mechanism has been studied.

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Mechanism of Ion Beam Mixing of Mo Layer on Si

[English abstract of article by Gao Wenyu [7559 2429 3768] of the Xinjiang Institute of Physics, Chinese Academy of Sciences, Urumqi; Li Hongcheng [2621 1347 2052], et al., of the Institute of Physics, Chinese Academy of Sciences]

[Text] Backscattering spectrometry is used to systematically investigate the temperature, dose and dose-rate dependencies of Mo/Si atomic mixing and the reaction induced by 170 keV Ar$^+$ ions and 300 keV Xe^{2+} ions. These results show that the ion beam mixing mechanism of the Mo/Si system is not vacancy diffusion and intra-cascade interstitial diffusion, and that the thermal spike model does not apply either. The authors suggest that the mechanism of Mo/Si atomic mixing induced by ion implantation should be interstitial diffusion and give a reaction model. Based on this concept, the experimental results can be explained.

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Far-Infrared Reflection Spectra of High-T_c Oxide Superconductors $MBa_2Cu_3O_{7-\delta}$ (M = Y, Sm, Gd, Eu)

40090068e Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 5, May 89 pp 761-767

[English abstract of article by Ye Hongjuan [0673 4767 1227], et al., of Shanghai Institute of Technical Physics, Chinese Academy of Sciences; Cao Ning [2580 1337], et al., of the Institute of Physics, Chinese Academy of Sciences; Miao Baicai [4924 2672 6299] of the Department of Physics, Fudan University, Shanghai]

[Text] The far-infrared reflection spectra of the oxide superconductors $MBa_2Cu_3O_{7-\delta}$ (M = Y, Sm, Gd, Eu) are reported in this paper. The spectra cover the frequency region of 40-360 cm^{-1}, and the temperature varies from 4.2 K to 300 K. All the spectra of this series of oxide superconductors exhibit the same kind of structure: there are five reflection peaks and three inversion structures. The first two peaks at lower frequencies have been identified as being associated with the collective vibrations of Ba, Cu, O ions and M, O ions, with B_{1u} symmetry, while the other three peaks result from the bending vibrations of the Cu-O bonds. The three inversion structures in the spectra may be correlated to the superconducting energy gaps.

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Control of Linewidth of Semiconductor Laser by Laterally Coupled Cavity

40090068f Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 5, May 89 pp 818-823

[English abstract of article by Guo Changzhi [6753 7022 1807], et al., of the Department of Physics, Beijing University]

[Text] The control of the modal linewidth broadening enhancement factor by a laterally coupled-cavity waveguide has been analyzed. It is found that when the coupling is weak and the fluctuations of injected non-equilibrium carriers due to spontaneous radiative recombination in the two cavities are independent, the modal linewidth broadening enhancement factor may approach zero, thus making the linewidth decrease by an order of magnitude or more. The near- and far-field distributions and the modal discrimination between in-phase and out-of-phase modes are discussed.

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Effects of Structural Relaxation, Crystallization on Superconducting Properties in Amorphous Alloy $Zr_{87.7}Si_{12.3}$

40090068g Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 5, May 89 pp 853-858

[English abstract of article by Zhou Xianyi [0719 0341 1942], et al., of the Department of Physics, University of Science and Technology of China; Liu Zhiguo [0491 3112 0948] of the Solid State Microstructure Laboratory, Nanjing University]

[Text] The amorphous alloy $Zr_{87.7}Si_{12.3}$ has been treated for one hour with isochronal annealing. Changes in the superconducting critical parameters T_c and H_{c2} and their transition widths have been measured for different annealing temperatures. The different change laws of metal-metal-type amorphous alloys have been observed. The experimental results are discussed in connection with the topological short range order and the chemical short range order during structural relaxation and the corresponding crystallization mechanism.

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On Improvement of Rotor Blade Loss Model of Axial Flow Fan, Compressor Including Effect of Rotation, Its Application

40090070a Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 10 No 2, May 89 pp 146-151

[English abstract of article by Zhong Fangyuan [6988 5364 3293], et al., of Shanghai Jiaotong University]

[Text] Through the theoretical analysis of the three-dimensional flow in the rotary blade boundary layer of the axial flow fan and proper mathematical deduction, the authors have obtained a simple method for predicting the wake width of a rotor blade which includes the effect of blade rotation and is convenient for engineering use. Based on this method, a rotor spanwise aerodynamic loss distribution model, including the effects of blade passage secondary flow and radial mass migration in the rotor blade boundary layer induced by rotation, has been developed. The aerodynamic and noise calculation using the above theory has been satisfied with experimental data. The error of efficiency is less than 1.3 percent and the noise (total sound pressure level) is less than 1dB.

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Experiment, Analysis of Heat Transfer from Horizontal Immersed Tube in Different Locations in Large Particle Fluidized Bed

40090070b Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 10 No 2, May 89 pp 178-182

[English abstract of article by Zhang Hua [1728 5478], et al., of the Institute of Engineering Thermophysics, Chinese Academy of Sciences]

[Text] In this paper, the changing patterns of circumferentially averaged heat transfer coefficients with fluidization velocity around a horizontal heated tube immersed in different horizontal positions in a large particle fluidized bed have been studied.

Based on the experiments, a three-division model of heat transfer coefficients, increasing with the fluidization velocity, has been set up. The experiments also reveal that the effects of horizontal position variation of the horizontal tube in the bed on the heat transfer coefficients are of minor importance.

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Experimental Study of Local Flow Properties of Horizontal Tubes in Fluidized Beds

40090070c Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 10 No 2, May 89 pp 183-185

[English abstract of article by Lu Jidong [7120 4949 2639], et al., of Huazhong University of Science and Technology]

[Text] The experimental results of the local flow properties near the horizontal tubes immersed in fluidized beds are reported in this paper. Its aim is to understand in essence the mechanics of heat transfer in fluidized beds. It is found through the analysis of the experimental data that the complex gas-solid two-phase flow near the immersed surfaces is a dominative factor to the uneven distribution of the heat transfer coefficients around the horizontal tubes.

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